

REMARKS/ARGUMENTS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 1-5, 7-13, 15-21, and 23 are pending in the present application, Claims 1, 5, 7-13, 15-21, and 23 having been amended, and Claims 6, 14, and 22 having been canceled.

Applicants respectfully submit that no new matter is added.

In the outstanding Office Action, Claims 1-7, 16-17, and 19-23 were rejected under 35 U.S.C. §102(e) as anticipated by Baldauf et al. (U.S. Patent Publication No. 2002/0119352, hereinafter Baldauf); Claims 8-15 were rejected under 35 U.S.C. §102(e) as anticipated by Kawasumi et al., (U.S. Patent No. 6,641,944, hereinafter Kawasumi); and Claims 10 and 18 were rejected under 35 U.S.C. §103(a) as unpatentable over Baldauf in view of Kawasumi.

Initially, it is noted that the specification is amended to correct minor grammatical informalities, without the introduction of new matter.

In a non-limiting embodiment of the claimed invention, any fluid applied as fuel for the fuel cell system is kept in a liquid phase throughout the system (i.e., from the fuel tank through the fuel supply path, which includes heat exchangers intervening in the fuel supply path). The liquid fuel is used to generate electricity in the fuel cell. As explained in the specification for a non-limiting embodiment of the claimed invention, the fuel cell system includes a liquid fuel cell. For example, the specification recites “The present invention relates to a liquid fuel cell..., directly employing a liquid organic compound, such as methanol, as fuel so as to generate electric power.”¹ The specification also recites “The MEA

¹ Specification, page 1, lines 11-16 (emphasis added).

7 with packinings 9A and 9B are put between a separator 13 having a flow path 11 for flowing methanol aqueous solution as fuel....”²

Thus, heat exchangers in the non-limiting embodiments of the claimed invention do not intensively carry out evaporation or vaporization of the liquid fuel.

With respect to the rejection of Claim 1 as anticipated by Baldauf, Applicants respectfully submit that the amendment to Claim 1 overcomes this ground of rejection.

Amended Claim 1 recites

A fuel cell system comprising:

a liquid fuel cell having an anode, a cathode and an electrolyte membrane put therebetween;

a fuel supply unit supplying liquid fuel to the anode;

an air supply unit supplying air to the cathode; and

a heat exchanger exchanging heat between the liquid fuel supplied by the fuel supply unit to the anode and an exhaust exhausted from the liquid fuel cell.

Applicants respectfully submit that Baldauf does not disclose or suggest the subject matter of amended Claim 1.

The fuel cell disclosed in Baldauf uses gaseous fuel, and not a liquid fuel. As shown in Fig. 1 of Baldauf, methanol 8 travels through mixer 5, pump 7, and evaporator 2 before traveling to the fuel cell stack 1. The evaporator converts the liquid methanol into a gas, and it is this gas the fuel cell stack uses. Baldauf recites “...and the fuel cell mixture is evaporated before it enters the stack 1.”³

Furthermore, Baldauf does not disclose or suggest the claimed “a heat exchanger exchanging heat between the liquid fuel supplied by the fuel supply unit to the anode and an exhaust exhausted from the liquid fuel cell.” The outstanding Office Action equates

² Specification, page 7, lines 15-18 (emphasis added).

³ Baldauf, paragraph [0072].

Baldauf's condenser 4 to the claimed heat exchanger. However, condenser 4 does not exchange heat between the liquid fuel supplied by the fuel supply unit to the anode and an exhaust exhausted from the liquid fuel cell.

In view of the above-noted distinctions, Applicants respectfully submit that Claim 1 (and Claims 2-5 and 7 dependent thereon) patentably distinguish over Baldauf. Claim 16 recites elements similar to those of Claim 1. Thus, Applicants respectfully submit that Claim 16 (and Claims 17-23) patentably distinguish over Baldauf, for at least the reasons stated for Claim 1.

With respect to the rejection of Claim 8 as anticipated by Kawasumi, Applicants respectfully submit that the amendment to Claim 8 overcomes this ground of rejection.

Amended Claim 8 recites

A fuel cell system comprising:

a liquid fuel cell having an anode, a cathode and an electrolyte membrane put therebetween;

a fuel supply unit including a mixing container mixing liquid fuel and an exhaust exhausted from the liquid fuel cell so as to form a liquid mixture, the liquid mixture being supplied to the anode;

an air supply unit supplying air to the cathode;
and

a heat exchanger connected to the mixing container so as to exchange heat between ambient air and the liquid mixture.

Applicants respectfully submit that Kawasumi does not disclose or suggest the subject matter of amended Claim 1.

In the fuel cell system of Kawasumi, fuel is evaporated into a gas phase and then applied to the fuel cell.⁴ Vaporizer 17 of Kawasumi is used to evaporate the fuel into a

⁴ Kawasumi, Fig. 1.

gaseous phase.⁵ Furthermore, Kawasumi does not disclose or suggest the claimed “a heat exchanger connected to the mixing container so as to exchange heat between ambient air and the liquid mixture.” The outstanding Office Action equates Kawasumi’s vaporizer 17 to the claimed heat exchanger. However, vaporizer 17 is not connected to the mixing container so as to exchange heat between ambient air and the liquid mixture.

In view of the above-noted distinctions, Applicants respectfully submit that Claim 8 (and Claims 9-15 dependent thereon) patentably distinguish over Kawasumi.

Furthermore, in support of the above-noted distinctions, Applicants note that McGraw-Hill’s Dictionary of Scientific and Technical Terms, fifth edition, provides the following definitions for evaporator and vaporizer:

Evaporator – Any of many devices in which liquid is changed to the vapor state by the addition of heat

Vaporizer – A process vessel in which a liquid is heated until it vaporizes; heat can be indirect or direct.

In the evaporator and the vaporizer, evaporation of liquid inherently and necessarily occurs and heat exchanged between two working fluids is not an inherent function. In contrast, as understood from the above-arguments, the term “heat exchanger” used in Claims 1, 8, and 16 refers to a device for exchanging heat between two working fluids without either evaporation or vaporization, at least as an intended function. Thus, the claimed “heat exchanger” in Claims 1, 8, and 16 patentably distinguishes over the evaporator and vaporizer disclosed in Baldauf and Kawasumi.

In view of the above-noted distinctions, Applicants respectfully submit that Claim 8 (and Claims 9-15 dependent thereon) patentably distinguish over Kawasumi.

⁵ Kawasumi, col. 2, lines 11-12.

Furthermore, Applicants respectfully submit that Claims 1-5, 7-13, 15-21, and 23 patentably distinguish over any proper combination of Baldauf and Kawasumi.

Consequently, in light of the above discussion and in view of the present amendment, the present application is believed to be in condition for allowance and an early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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